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ANNOUNCEMENTS

OF

THE SCHOOL OF SCIENCES

1909-1910

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J. H. FURST COMPANY, PRINTERS

BALTIMORE

THE FACULTY OF SCIENCES

His Eminence, James Cardinal Gibbons, *Chancellor of the University.*

Very Rev. Thomas J. Shahan, S.T.D., J.U.L., *Pro-Rector of the University.*

Very Rev. John Joseph Griffin, Ph.D., *Dean, Professor of Chemistry.*

Daniel William Shea, Ph.D., *Vice-Dean and Secretary, Professor of Physics.*

Aubrey Edward Landry, Ph.D., *Associate Professor in Mathematics.*

Thomas Jefferson Thompson, A.B., C.E., *Instructor in Civil Engineering.*

Alfred Doolittle, A.B., *Instructor in Mathematics and Astronomy.*

George Francis Harbin, A.B., E.E., Diploma from the Westinghouse Electric and Manufacturing Company's Engineering Course, *Instructor in Electrical Engineering.*

DEPARTMENTS OF THE SCHOOL OF SCIENCES

The School of Sciences comprises the following Departments:

The Department of Mathematics.
The Department of Chemistry.
The Department of Physics.
The Department of Astronomy.
The Department of Civil Engineering.
The Department of Electrical Engineering.
The Department of Biology.
The Department of Botany.

THE DEPARTMENT OF MATHEMATICS

Aubrey E. Landry, Ph.D.
Alfred Doolittle, A.B.

This Department has been established in order to enable the student to complete the studies in Mathematics which he commenced in the College or Academy, and especially to prepare himself for his intended work in other Departments of the School of Sciences. For admission to its lowest courses a thorough knowledge of algebra through quadratics, and of plane geometry, will be required. The qualifications necessary for entrance to its advanced courses are stated in connection with the courses as hereinafter announced. Instruction in Algebra and Plane and Solid Geometry will be provided should there be a sufficient demand.

COURSES OF INSTRUCTION

I. Advanced Algebra.—(Logarithms, series, elementary theory of equations.) Lectures and problem exercises. [3 hrs. Half-year.] [1]—Mr. Doolittle.

II. Trigonometry.—(Plane Trigonometry and the Elements of Spherical Trigonometry.) Lectures and problem exercises. [3 hrs. First half-year.]—Mr. Doolittle.

III. Analytic Geometry.—(Plane Analytic Geometry and the Elements of Solid Analytic Geometry. Trigonometry required). Lectures and problem exercises. [2 hrs.]—Mr. Doolittle.

IV. Calculus.—(Differential and Integral Calculus, elementary course. Analytic Geometry required.) Lectures and problem exercises. [4 hrs.]—Dr. Landry.

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[1] The figures in brackets indicate the number of hours of lectures per week throughout the year. If the course is for a period less than one year, its duration is also indicated in the brackets.

V. Calculus.—(Differential and Integral Calculus, advanced course. Calculus, elementary course required). Lectures and problem exercises. [4 hrs.]—Dr. Landry.

VI. Differential Equations.—(Calculus, advanced course required.) Lectures and problem exercises. [3 hrs. Half-year]—Dr. Landry.

VII. Elementary Theory of Functions.—(Calculus, advanced course required.) [3 hrs.]—Dr. Landry.

THE DEPARTMENT OF CHEMISTRY

Very Rev. Dr. John J. Griffin

The courses in Chemistry are organized with the general aim of exciting in the student a spirit of inquiry and of training him to the habit of persistent work, and of dealing intelligently and correctly with nature and its laws. In Chemistry, as in all other experimental sciences, progress consists in the discovery and classification of facts. Hence the student must be made acquainted with the methods of observation, and experimental facts, and the laws of Chemistry. From the very beginning of his course the greatest stress will be laid upon laboratory work; but lectures will be regularly given in General, Organic, Theoretical, and Physical Chemistry, and, from time to time, on selected topics.

Though the courses are primarily intended for those looking forward to a career as scientists or teachers, the instruction and training imparted in them is of equal importance and utility to the analyist, the practical and the technical chemist.

A liberal allowance of material and apparatus is permitted to each student, and excellent facilities for the production of special apparatus are at his disposal.

The courses of instruction offered in this Department commence with the rudiments of the science in order that the student may be properly prepared, both in knowledge and method of study, for profitable work in the more advanced courses. The only requirements for admission to the elementary courses are the ability to read text-books intelligently and to perform the prescribed laboratory work.

COURSES OF INSTRUCTION

I. General Chemistry.—This course is designed to illustrate the general laws and doctrines of Chemistry, leading the student, by observation of the fundamental facts of the science, to grasp the connection between these facts and the underlying principles. Prominence is also given to those principles of Physics which find application in chemical operations. The laboratory work in connection with this course includes the preparation from ores and other crude materials of a number of chemical compounds; the detailed study of these; practical proofs of chemical laws, and a thorough drilling in qualitative analysis. [9 hrs.]

II. Organic Chemistry.—In this course the student is introduced to the study of the compounds of carbon. The points of similarity and difference between organic and inorganic Chemistry are touched upon, then the most important members of the parafine and aromatic series are studied in detail, and the development of this branch of Chemistry and its bearing upon chemical theory are considered.

In the laboratories the student is given practice in quantitative analysis, both inorganic and organic, more or less extensive according to the needs of his future work. He studies the methods of purification of organic compounds, the preparation and identification of typical substances, and such others as will familiarize him with the various methods of reduction, oxidation, nitrification, sulphonation, etc., on which the great chemical industries are based. [9 hrs.]

III. QUANTITATIVE ANALYSIS.—A laboratory course comprising practical instruction in the most important methods of analysis, gravimetric, volumetric, electrolytic and organic. [9 hrs.]

IV. PHYSICAL CHEMISTRY.—Measurements of mass and volume, specific gravity, determinations of matter in its various states, the phase law and mass reactions, thermo-chemistry and calorimetry, osmotic pressure and the theory of solutions, theory and use of the spectroscope, polariscope and refractometer. Lectures and laboratory work. [5 hrs. Half-year.]

V. ELECTRO-CHEMISTRY.—Theory of the voltaic cell, electro-chemical oxidation and reduction, deposition of metals, determination of conductivity of solutions. Lectures and laboratory work. [5 hrs. Half-year.]

VI. GAS ANALYSIS.—Examination of air, furnace and illuminating gas. Laboratory course. [5 hrs. Half-year.]

VIII. INDUSTRIAL CHEMISTRY.—The preparation of chemical products from raw materials. Methods of purification and testing. Economic factors in production, and the utilization of waste products. Laboratory course. [5 hrs.]

VIII. METALLURGY.—Wet and fire assays of ores, and testing of the refined products. Laboratory course. [5 hrs.]

IX. ADVANCED WORK.—This course will consist of a detailed study of some of the classical pieces of work which have been of epoch-making influence or of great theoretical importance. In addition the formation of the reading habit, so essential to the success of the working chmist, will be encouraged, and for the furtherance of this object the student will be required to summarize from the original papers the important phases of chemical development. The chemical library is very well equipped for this work. It is rich in complete series of the most important periodicals and in all the current periodical literature of the science. The student will find a reading knowledge of French and German necessary in this stage of his work.

In the laboratory the student will undertake the preparation of the more difficult chemical compounds and the study of complex reactions; after which the research work, upon the result of which his thesis for the doctorate is based, will be undertaken. From time to time during the period of advanced work, short lecture courses, supplemented by laboratory work, will be given in physical and electro-chemistry, toxicology, industrial, and pharmaceutical chemistry.

THE CHEMICAL LABORATORY, LIBRARY AND MUSEUM

Ample facilities are provided for extensive laboratory work in any of the courses. The Chemical Museum affords opportunity for the study of ores and metals and the crude and refined products of chemical industry.

Arrangements have been made for the temporary accommodation of the Chemical Department in the east wing of McMahon Hall. On the third floor are situated the laboratories.

The laboratory of General Chemistry occupies the northeast corner of this story. Its floor dimensions are 40 x 30 feet. The height ranges from 17 feet at the sides to 30 feet in the center. The room is well lighted from windows on two sides, and it provides ample accommodations for thirty-six students. The Analytical laboratory is of the same dimensions as the laboratory of General Chemistry, and is fitted up for twenty-four students. The working tables are supplied with water, gas, suction, and electricity. The blast burners in this, and in the other laboratories, are supplied with air under pressure by an air pump in the basement. The Organic laboratory is 40 x 25 feet. Especial care has been taken in fitting up this laboratory to provide the advanced worker with all the most recent time-saving devices and conveniences. Each table is provided with taps for gas, water, steam and suction. Within easy access of every working place there is a large sink. The hood-room is ample, being equal to the table-room. At the end of the corridor is the balance-room, the balances being on slate shelves, bracketed to the masonry walls of the building.

No efforts have been spared in making the library of the Department so complete that the research student can have easy access to all there is of standard chemical literature. Historical Chemistry is represented by the works of Kopp, Berthelot, Meyer, etc., and by many of the original papers of the eighteenth century chemists. The principal dictionaries: Beilstein, Ladenburg, Watt, and Thorpe, represented by the latest editions, and the larger treatises of Ostwald, Meyer and Jacobson, Dammer, Meyer, Roscoe and Schlorlemmer, together with many lesser works, furnish the student with the latest ideas in theory and practice. A collection of 4,000 dissertations and monographs, with a card catalogue of the same, adds greatly to the efficiency of the library. The library is especially rich in periodical literature, possessing complete sets of the following journals: Annales de Chimie et de Physique, Journal für Praktische Chemie, Annalen der Chemie (Liebig), Journal of the Chemical Society (London), Bulletin de la Société Chimique de Paris, Berichte der Deutschen Chemischen Gesellschaft, Zeitschrift für Analytische Chemie, Zeitschrift für Anorganische Chemie, The Chemical News (London), Elektrochemische Zeitschrift, Zeitschrift für Elektrochemie, Chemisches Central Blatt, Monatshefte für Chemie, The American Chemical Journal, Zeitschrift für Physikalische Chemie, Recueil des Travaux Chimiques des Pays-Bas, Hoppe-Seyler's Zeitschrift für Physiologische Chemie, The Journal of the American Chemical Society, The Journal of Physical Chemistry, Moniteur Scientifique Quesneville, Zeitschrift für Angewandte Chemie, Jahresberichte über die Fortschritte der Chemie, Gazetta Chimica Italiana, Revue Générale de Chimie Pure et Appliquée.

The lecture-room is on the fourth floor of the central portion of the building. On this floor also are the Chemical Museum, the apparatus-office, rooms for photographic work, and the distilled-water apparatus.

Laboratory Fees.—The fee for those whose courses call for six hours of laboratory work per week is $20.00. For those who spend a greater time in the laboratory, $30.00. Laboratory fees are payable in advance. Ordinary chemicals are not charged for. Costly chemicals, and all apparatus in charge of the student, must be receipted for by him. The receipts are held by the custodian of apparatus till the time of settlement of accounts, when all apparatus not returned must be paid for.

The Chemical Museum contains collections which serve to illustrate inorganic and organic chemistry. In it are found, in well arranged cases, the various ores from which the metals are obtained, and the latter in various stages of refinement; typical compounds prepared by students working in the laboratories; and a very large collection of samples of the crude and refined products of chemical industry received from manufacturing chemists in all parts of the United States and Europe.

THE DEPARTMENT OF PHYSICS

Dr. Daniel W. Shea

This Department furnishes opportunity for instruction and research in the various branches of Physics. Its purpose is twofold: (1) To give students of any other Department of the University such an acquaintance with the principles and facts of Physics, and with the methods of exact physical measurements, as may be deemed requisite for the intelligent pursuit of their chief work; (2) To give students of this Department a comprehensive and exact knowledge of experimental and mathematical Physics, and a training in the methods of research that will fit them to pursue original work.

Instruction will be given by means of lectures, laboratory practice, seminars, and other academic devices as may be deemed necessary. Every incentive and facility possible will be offered for original work of the highest character. The Physical Laboratory offers good opportunity for regular laboratory work and original research.

The Government museums and institutions afford advantages for students in this Department. The library of the Department is supplied with the standard works of reference and with the principal scientific periodicals.

There is a laboratory fee of $10.00 for each of the courses Physics I, II, and IV.

COURSES OF INSTRUCTION

I. General Theoretical and Experimental Physics.—Mechanics, Sound, Light, Heat, Electricity and Magnetism. Lectures with demonstrations. Measurements of the principal physical quantities, in the Laboratory. (Mathematics II required.) [3 hrs. lectures and 6 hrs. laboratory.]

II. Advanced Theoretical and Experimental Physics.—Mechanics, Sound, Light, Heat, Electricity and Magnetism. Lectures and Laboratory. (Physics I and Mathematics IV required.) [1 hr. lectures and 6 hrs. laboratory.]

III. Mathematical Physics.—Lectures. (Physics II and Mathematics VI required.) [3 hrs. lectures],

IV. Research.—(Physics II or its equivalent required.) The laboratory for research is always open to advanced students, and their work is under constant supervision of the Professor of Physics.

V. Physical Seminar.—(Parts of Physics II and III and other accomplishments, to be determined for each applicant, required.) [1 hr.]

The Physical Laboratory occupies several rooms on the first floor and in the basement of McMahon Hall, all pleasantly located and supplied with gas, water, steam, electricity, blast and vacuum connections, and other conveniences for rapid and satisfactory work. The equipment, which is already considerable, represents the best productions of the leading instrument makers of the world. Additions are being made as rapidly as needed. A large workshop supplied with steam power, machines and tools, gives excellent opportunity for the quick manufacture of special pieces of apparatus.

THE DEPARTMENT OF ASTRONOMY

Alfred Doolittle, A.B.

This Department has been opened in connection with the operation of the Astronomical Observatory of the University for the training of students in theoretical and practical Astronomy. For admission to the Department a High School education or its equivalent, comprising mathematics, including trigonometry, elementary physics and chemistry, will be required.

COURSES OF INSTRUCTION

I. General Astronomy. [First half-year.]
II. Practical Astronomy. [Second half-year.]
III. Orbit Computation. [Second half-year.]

Students desiring to take up special work in Practical Astronomy will arrange with the instructor.

The Observatory is situated on the highest point of the University grounds, and is equipped with an equatorially-mounted telescope of nine inches aperture, a meridian circle, a sidereal clock, a chronograph, chronometers, etc.

THE DEPARTMENT OF CIVIL ENGINEERING

THOMAS J. THOMPSON, A.B., C.E.

This Department is intended to prepare young men for a practical career in Civil Engineering. The courses begin with the rudiments of the subject. For admission to the elementary courses algebra and plane geometry are required. The qualifications for pursuing advanced courses are stated as the courses are hereinafter announced.

There is a fee of $10.00 for the use of instruments in Course III.

COURSES OF INSTRUCTION

I. MECHANICAL DRAWING. (Use of instruments; problems in geometrical drawing; line shading; orthographic and isometric projection; free hand sketching and lettering; tracing and blue printing; working drawings of machines and structures.) Lectures and drawing. [6 hrs.]—MR. THOMPSON.

II. DESCRIPTIVE GEOMETRY.—(Elementary principles; problems relating to the point, line and plane; intersection of planes and solids; intersection of solids; development of surfaces; shades and shadows. Mechanical drawing required.) Lectures and drawing. [6 hrs. First half-year.]—MR. THOMPSON.

III. LAND AND TOPOGRAPHICAL SURVEYING.—(Use of instruments; differential and profile leveling; chain, compass and transit land surveying; plane table, transit and stadia, and cross-section topographical surveying; computation and plotting; field work. Trigonometry required.) Lectures, drawing and practice. [6 hrs. Second half-year.]—MR. THOMPSON.

IV. RAILROAD ENGINEERING.—(Reconnaissance, preliminary and location methodsof making surveys; curves and grades; mapping; computation of earthwork and estimation of haul; field-work. Land and Topographical Surveying required.) Lectures, drawing and practice. [6 hrs. Second half-year.]

V. GEODETIC SURVEYING.—(Triangulation systems; methods of base-line measurements; adjusting angle observations; determination of latitude, longitude and azimuth; field-work. Land and Topographical Surveying required.) Lectures and practice. [3 hrs. Half-year.]

VI. GRAPHICAL STATICS.—(Analysis of different types of roof trusses under vertical and inclined loads; solution of selected problems by graphical diagrams. Trigonometry and Mechanics required.) Lectures, computations and drawing. [6 hrs. First half-year.]—MR. THOMPSON.

VII. ELEMENTS OF STRUCTURAL DESIGN.—(Solution of simple problems constantly met in practice; algebraic determination of stresses in trusses due to uniform and concentrated loads. Graphical Statics required.) Lectures and computations. [3 hrs. Half-year.]—MR. THOMPSON.

VIII. ROOFS AND BRIDGES.—(Algebraic and graphic determination of stresses due to fixed and moving loads; design of typical structures and working drawings of them; drawing. Elements of Structural Design, Differential and Integral Calculus required.) [6 hrs.]—MR. THOMPSON.

IX. HYDRAULICS.—(Hydrostatics; theoretical hydraulics; flow over weirs; flow through pipes and orifices; flow through conduits; coefficients; the Venturi meter; water wheels; impulse and reaction turbines; water-power. Differential and Integral Calculus required.) Lectures, computations and practice. [3 hrs. Half-year.]—MR. THOMPSON.

X. MASONRY AND FOUNDATIONS.—Study of the materials employed in stone, brick and concrete structures; design of foundations, retaining walls, masonry dams and arches; cement testing. Elements of Structural Design required.) Lectures, drawing and practice. [3 hrs. Half-year.]

XI. SANITARY ENGINEERING.—(Study of the methods of construction, maintenance and design of sewerage system; methods of sewage disposal. Hydraulics required). Lectures and inspection. [3 hrs. Half-year.]

XII. Water Supply Engineering.—(Study of the methods of construction of supply systems; purification and filtration; irrigation. Hydraulics required.) Lectures and inspection. [3 hrs. Half-year.]

XIII. Highway Construction.—Location, construction, and maintenance of common roads, streets and pavements. Land and Topographical Surveying required.) Lectures and inspection. [3 hrs. Half-year.]

XIV. Civil Engineering Laboratory.—Sketches and reports; calibration of instruments; investigation of efficiency of machines; measurements of water flow; testing of materials.) Practice. [3 hrs.]

THE DEPARTMENT OF ELECTRICAL ENGINEERING

George F. Harbin, A.B., E.E.

The purpose of this Department is to prepare young men for practical work as electrical engineers. Both elementary and advanced courses in the subject are offered. For admission to the elementary courses general elementary physics and mathematics, including analytical geometry, are required.

There is a laboratory fee of $10.00 in Courses I and II.

COURSES OF INSTRUCTION

I. Direct Current Machinery.—(Fundamental principles of direct current generators and motors, and practice in their testing and operation. General Physics and Differential and Integral Calculus required.) Lectures and testing. [6 hrs.]

II. Alternating Current Machinery.—(Fundamental principles of alternating current generators, motors and transformers, and practice in their operation and testing. Direct Current Machinery and Differential and Integral Calculus required.) Lectures and testing. [6 hrs.]

III. Design of Direct Current Machinery.—(Design of direct current generators and motors with calculations. Direct Current Dynamo-Electric Machinery, Mechanical Drawing, and Machine Design required.) Lectures, computations and drawing. [3 hrs. First half-year.]

IV. Design of Alternating Current Machinery.—(Design of transformers, with calculations. Alternating Current Dynamo-Electric Machinery and Design of Direct Current Machinery required.) Lectures, computations and drawing. [3 hrs. Second half-year.]

V. Electric Lighting.—(Design, installation and operation of direct and alternating systems and plants. Design of Direct Current Machinery and Design of Alternating Current Machinery required.) Lectures, computations and drawing. [3 hrs. Fall term.]

VI. Electrical Distribution of Power.—(Principles and methods of transmitting power by direct and alternating currents. Electric Lighting, Land and Topographical Surveying required.) Lectures, computation, drawing and inspection. [3 hrs. Winter term.]

VII. Primary and Secondary Batteries.—(Theory and testing. General Physics and General Chemistry required.) Lectures and testing. [3 hrs. Winter term.]

VIII. Telephone and Telegraph.—(Theory and testing. General Physics required.) Lectures, testing and inspection. [3 hrs. Fall term.]

IX. Electric Railways.—(Construction, equipment and operation. Electrical Distribution of Power required.) Lectures, testing and inspection. [3 hrs. Spring term.]

X. Direct and Alternating Current Machinery.—Fundamental principles, testing and applications. General Physics and Analytic Geometry required. Not open to candidates for degrees in Electrical Engineering. Lectures and testing. [4 hrs.]

THE DEPARTMENT OF BIOLOGY

This Department is intended to afford to students preparing for the medical profession, or for advanced courses in Psychology, Economics, or Sociology, an opportunity to acquire a general knowledge of the subject of Biology, as well as to pursue special studies in any of the Biological Sciences. For admission to the Department a High School education or its equivalent, including elementary physics, chemistry and geology, is required.

COURSES OF INSTRUCTION

I. General Biology.—This course consists of lectures and laboratory work. In the laboratory the student studies a series of selected types of animals and plants from such simple forms as the Amoeba and the Haematococcus to the fern, the flowering plant, the frog and the rat. Both the lectures and the laboratory work of this course are designed to give the student a general view of the process of life and growth and of the manifold interrelationships of living things. The large body of interesting phenomena which forms the content of this course, and the training in dealing with the cumulative evidence which it affords, render it a desirable part of a liberal education. [4 hrs. lectures, 5 hrs. laboratory.]

II. Histology.—This course is intended to give the student a practical knowledge of the minute structure of the various organs of the animal body, and to familiarize him with the laboratory technique. [3 hrs. lectures, 5 hrs. laboratory.]

III. Physiology.—This course is intended for those who contemplate taking up the study of medicine, as well as for those who intend to pursue graduate work in Physiology or Physiological Psychology. [3 hrs. lectures, 5 hrs. laboratory.]

IV. General Zoology.—This course comprises the elements of Systematic Zoology, Comparative Anatomy and Embryology. [4 hrs. lectures, 5 hrs. laboratory.]

Of these courses, only I.—General Biology—will be given in 1909-1910.

THE DEPARTMENT OF BOTANY

This Department offers elementary courses in the general science of Botany as well as advanced courses in Systematic and Economic Botany. For admission to this Department a High School education or its equivalent is required.

The Herbarium of the University, though not among the largest, is second to none, in the possessions of any institution of importance, as regards North American botany. It has been augmented by large purchases of Mexican, South American and Polynesian plants, and extensive exchanges with European botanists, and has been further enriched by the gift of the Rev. Father Langlois' large collection, and by a considerable part of that amassed by the late Rev. J. H. Wibbe.

Nearly the whole Herbarium is now arranged for study, and a large part is mounted; so that students and professional botanists have ready access to all its rich materials for investigation and comparison.

DEGREES AND THEIR CONDITIONS

The University will confer the following degrees upon students in the School of Sciences who may be qualified to receive them: Bachelor of Science (B.S.); Bachelor of Science in Civil Engineering (B.S. in Civil Engineering); Bachelor of Science in Electrical Engineering (B.S. in Electrical Engineering); and Bachelor of Science in Chemical Engineering (B.S. in Chemical Engineering); Master of Science (M.S.); Doctor of Science (Sc.D); Electrical Engineer (E.E.); Civil Engineer (C.E.); Bachelor of Arts (A.B.); Master of Arts (A.M.); Doctor of Philosophy (Ph.D.).

Degrees may be conferred upon students who have fulfilled the following conditions: (1) They must have devoted a sufficient period of time to the prosecution of their studies; (2) They must have completed the course or courses of study required by the Constitutions or the Board of Trustees, or assigned to them by the Rector, as their preparation for the degree; (3) They must have passed the necessary examinations; (4) They must have been approved by the Chancellor, or his delegate, as candidates entitled to the degrees. The periods of study required for the different degrees may vary with the character and scope of the subjects of study, and with the attainments of the student at the time of his admission to the University. In ordinary cases, where the student commences the elementary branches of a subject upon his entrance to the University, at least three years shall be required for the Bachelor's degree; two additional years for the Master's or Engineer's degree; and two more years for the Doctor's degree. In other cases, where from the nature of the subject, or from the higher attainments necessary to commence his studies therein, the foregoing rule would be inapplicable to the student, the required period of study will be determined by the Rector after consultation with the Professors in charge of the Department or Departments, in which the studies are to be pursued.

The courses of study required for degrees, excepting the degrees in Science and Engineering and the Bachelor of Arts degree, may be taken by the student wholly in one Department, or in two or more Departments, as he may elect; *provided,* that all lay students must pursue a course of at least one year in Philosophy.

Where the subjects and courses of study are not prescribed the student must notify the Rector in writing of his election of a Department or Departments, and the Rector will then, after consultation with the Professors in charge of such Departments, fix the required courses of study.

Where the degrees in Science are to be conferred as professional degrees, the customary courses of study leading thereto must be pursued as directed.

I. BACHELOR OF SCIENCE COURSE

The courses of study leading to the degree of Bachelor of Science cover a period of four academic years of thirty weeks each, and occupy the student in class room and laboratory work for twenty-one hours in each week. Certain courses of study are required; others are elective. The electives include all the courses offered in the University which the student may be qualified to pursue. The allotment of studies for each year is as follows:

First Year:

- Advanced Algebra, three hours, half-year.
- Trigonometry, three hours, half-year.
- Analytical Geometry, two hours, one year.
- Chemistry (three hours lectures and six hours laboratory), six hours, one year.
- Mechanical Drawing (one hour lecture and seven hours drawing), four and one-half hours, one year.

SECOND YEAR:

Calculus, four hours, one year.
Descriptive Geometry (two hours lectures, two hours drafting, half-year), one and one-half hours, one year.
Physics (three hours lectures and six hours laboratory), six hours, one year.
Land and Topographical Surveying (two hours lectures, eight hours field work, half-year), three hours, one year.
English, three hours, one year.
History or other electives, four and a half hours, one year.

THIRD YEAR:

Philosophy, three hours, one year.
Christian Doctrine, three hours, one year.
Electives (of which nine must be from the School of Sciences), fifteen hours, one year.

FOURTH YEAR:

Philosophy, three hours, one year.
Christian Doctrine, three hours, one year.
Electives (of which nine must be from the School of Sciences), fifteen hours, one year.

II. BACHELOR OF SCIENCE IN CIVIL ENGINEERING COURSE

The period of study, number of hours per week, and courses for the first and second years are the same as those above prescribed for the degree of Bachelor of Science. For the third and fourth years the courses offered are the following.

THIRD YEAR:

Calculus, four hours, half-year.
Graphical Statics (two hours lectures and two hours drafting, half-year), one and one-half hours, one year.

Elements of Structural Design (two hours lectures and two hours drafting, half-year), one and one-half hours, one year.
Geodetic Surveying (one hour lecture and four hours field work, half-year), one and one-half hours, one year.
Direct and Alternating Current Machinery (two hours lectures and four hours laboratory), four hours, one year.
Philosophy, three hours, one year.
Christian Doctrine, three hours, one year.
Electives, six hours, one year.

FOURTH YEAR:

Roofs and Bridges (two hours lectures and two hours drafting), three hours, one year.
Hydraulics (two hours lectures and two hours laboratory, half-year), one and one-half hours, one year.
Railroad Engineering (two hours lectures and two hours field work, half-year), one and one-half hours, one year.
Masonry and Foundations (two hours lectures and two hours laboratory, half-year), one and one-half hours, one year.
Civil Engineering (laboratory), three hours, one year.
Christian Doctrine, three hours, one year.
Electives, seven and one-half hours, one year.

III. BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING COURSE

The period of study, number of hours per week, and courses for the first and second years are the same as those prescribed for the degree of Bachelor of Science. For the third and fourth years the courses offered are as follows:

THIRD YEAR:

Calculus, four hours, half-year.
Graphical Statics (two hours lectures and two hours drafting, half-year), one and one-half hours, one year.
Direct Current Machinery (two hours lectures and four hours laboratory), four hours, one year.
Shop Work (six hours), three hours, one year.
Philosophy, three hours, one year.
Christian Doctrine, three hours, one year.
Electives, six hours, one year.

FOURTH YEAR:

Alternating Current Machinery (two hours lectures, four hours laboratory), four hours, one year.
Design of Direct Current Machinery, three hours, half-year.
Design of Alternating Current Machinery, three hours, half-year.
Machine Design, three hours, one year.
Christian Doctrine, three hours, one year.
Electives, six hours, one year.

IV. BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING COURSE

The period of study, number of hours per week, and courses of study for the first and second years are the same as those prescribed for the degree of Bachelor of Science except that in the second year Organic Chemistry takes the place of Surveying and the Elective. The courses of study for the third and fourth years are as follows:

THIRD YEAR:

Calculus, four hours, half-year.
Land and Topographical Surveying (two hours lectures, eight hours field work, half-year), three hours, one year.
Electro-Chemistry, three hours, half-year.
Gas Analysis, three hours, half-year.
Philosophy, three hours, one year.
Christian Doctrine, three hours, one year.
Electives, six hours, one year.

FOURTH YEAR:

Quantitative Analysis, six hours, one year.
Metallurgy (six hours laboratory), three hours, one year.
Industrial Chemistry (six hours laboratory), three hours, one year.
Civil Engineering (laboratory), three hours, one year.
Christian Doctrine, three hours, one year.
Electives, three hours, one year.

V. MASTER OF SCIENCE COURSE

1. An approved COURSE OF STUDY consisting of *one* major and *one* minor subject. 2. Original investigation, or critical study in the line of the major subject. 3. A dissertation, embodying the results of the investigation or critical study.

VI. DOCTOR OF SCIENCE COURSE

1. An approved COURSE OF STUDY consisting of *one* major and *two* minor subjects. 2. Original investigation in the line of the major subject. 3. A dissertation, embodying the results of the investigation or critical study.

VII. CIVIL, OR ELECTRICAL ENGINEER COURSE

1. An approved Course of Study consisting of *one* major[1] and *one* minor[2] subject. 2. Original investigation or critical study, in the line of the major subject. 3. A dissertation, embodying the results of the investigation or critical study.

COURSE EXAMINATIONS

Annual examinations of students are held in all Departments near the close of the academic year upon the courses pursued during the year. Other examinations during the year are held at the option of the instructors.

CANDIDATES FOR DEGREES

Students desiring to become candidates for degrees are required to make a written application to the Rector at least one year before the date at which the degree may be conferred; and to present with this application certificates from the Professors in charge of the Departments in which the candidate is pursuing his studies, stating that he is making satisfactory progress in his academic work and will in their judgment be qualified to receive the desired degree at the date named therein.

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[1] By a major subject is meant several of the more advanced Courses of Instruction in some one Department.

[2] By a minor subject is meant one or more of the more advanced Courses of Instruction in some one Department.

EXAMINATIONS FOR DEGREES

Examinations for degrees are both written and oral. No student will be admitted to these examinations unless he has proved himself worthy of this honor by his diligence in study, his advancement in learning, and his integrity of life. Every applicant for the degree of Master or Doctor, before being admitted to an examination for the degree, must prepare a dissertation upon a subject approved by the Professors of the Departments in which he has pursued his studies, and when the dissertation is completed it must be submitted to them for acceptance. To entitle a student, who has finished his studies and passed his examinations, to receive his degree, the approval of the Chancellor of the University is necessary. This approval is given or withheld in view of the entire career of the candidate as a member of the University, and as apparent on its records. Degrees may be granted at any period in the academic year. The public award of Diplomas occurs on Graduation Day.

ADMISSION OF STUDENTS

The School of Science is open to all male students who are of good moral character, of studious habits, and who have attained the standard of scholarship required for admission to any of its Departments.

All applications for admission must be addressed to the Rector, and must be in writing and state the following particulars: (1) The full name, residence and age of the applicant; (2) The Department or Departments of the University which he desires to enter; (3) The character, extent, and place of his past education; (4) Degrees already received. This application must be accompanied by a certificate of his good moral character, and by a testimonial showing that he has attained the prescribed standard of scholarship. This certificate and testimonial may be signed by any responsible clergyman, magistrate, or professional teacher. Formal diplomas need not be forwarded unless subsequently required.

Due notice of the acceptance or rejection of the application will be given to the applicant. If, in the judgment of the Rector, an entrance examination should be necessary, he will designate a time and place for the examination convenient to the applicant, and appoint an examiner to conduct it.

When an applicant is admitted he will receive a certificate of admission, upon the presentation of which to the Professors in charge of the Departments named therein, such courses of study will be assigned to him as his previous training may fit him to pursue. These courses he must diligently follow according to the directions of his instructors, who are required to report his attendance and scholarship to the General Secretary every month for insertion in the permanent records of the University.

For admission to the Department of Mathematics, the applicant must have completed Plane Geometry, and Algebra through Quadratic Equations.

For admission to the Department of Chemistry, the aplicant must possess the ability to read text-books intelligently and perform the required laboratory work.

For admission to the Department of Physics, the applicant must have completed the study of Mathematics through Trigonometry.

For admission to the Department of Astronomy, the applicant must have received a high school education or its equivalent, including the study of Mathematics through Trigonometry, and of Elementary Physics and Chemistry.

For admission to the Department of Civil Engineering, the applicant must have completed Algebra and Plane Geometry.

For admission to the Department of Electrical Engineering, the applicant must have completed Analytical Geometry and General Elementary Physics.

For admission to the Department of Biology, a high school education or its equivalent, including Elementary Physics, Chemistry, and Geology, is required.

For admission to the Department of Botany, a high school education or its equivalent is necessary.

In pursuance of the General Constitutions of the University and the instructions of the Holy See given in the Apostolic Letter of March 7, 1889, the Board of Trustees have made the following regulation: "Any Catholic institution of learning, whose courses of instruction qualify its students for admission to any Department of the University, may at its own request and without prejudice to its autonomy be enrolled, by order of the Board of Trustees, among the affiliated institutions of the University; and being so enrolled, its graduates shall be admitted to those Departments of the University without examinations, upon presentation of the certificates or diplomas which attest their completion of its courses of study."

FEES AND EXPENSES

The annual fee for tuition is seventy-five dollars, payable semi-annually in advance. Laboratory expenses are not included in tuition fees. The graduation fees are: for the Degree of Bachelor, five dollars; for the degree of Master or Engineer, ten dollars; for the degree of Doctor, twenty-five dollars.

The following persons may be exempted from the payment of tuition fees at the discretion of the Rector: (1)

students who render scholastic services to the University as tutors, clerks, etc.; (2) students of narrow means who attain high degrees of merit at the annual examination; (3) graduates of Catholic Educational Institutions who are unable to pay full tuition fees, and who present to the Rector a certificate from the President of the Institution stating that the applicant attained high rank at his graduation examination. Exemption from tuition fees is also granted to students belonging to the religious Orders or Communities, to all grades of clerical students, and to one graduate at a time of every Catholic College which confers the Bachelor's degree, who presents a certificate from the President of the College that at the degree examination of the preceding academic year he attained a high rank. Any of these privileges and exemptions may be forfeited by bad conduct or neglect of studies.

The expenses for board and lodging need not exceed thirty dollars per month. Expenses for books, laboratory supplies, etc., will depend upon the courses which the student may pursue.

TERMS AND RECESSES

The academic year begins Tuesday, October 5, 1909, and ends Wednesday, June 8, 1910. It is divided into Fall, Winter, and Spring Terms by short Recesses, at Christmas and Easter.

The Christmas Recess begins Thursday, December 23, 1909, and ends Tuesday, January 4, 1910.

The Easter Recess begins Wednesday, March 23, 1910, and ends Tuesday, March 29, 1910.

REGISTER OF STUDENTS OF SCIENCES

1908-1909

The Department in which occurs the principal subject of the student, as a candidate for the degree Bachelor, Engineer, Master or Doctor, is indicated by *italics;* work in other Departments is indicated by Roman type.

CANDIDATES FOR DEGREES IN JUNE, 1909

FOR DOCTOR OF PHILOSOPHY

NAME — YEAR OF ENTRANCE — HOME RESIDENCE

Irving, Thomas Patrick, C.S.C., 1905. *Washington, D. C.*
A. B. (University of Notre Dame, Notre Dame, Ind.) 1904.
Department: *Physics.*

FOR CIVIL ENGINEER

Fennell, William Bernard, 1905. *Washington, D. C.*
B. S. (St. John's College, Washington, D. C.) 1905; B. S. (The Catholic University of America) 1908.
Departments: *Civil Engineering;* Electrical Engineering.

FOR BACHELOR OF SCIENCE

Crook, Louis Henry, 1906. *Brookland, D. C.*
Departments: *Civil Engineering;* Physics; Chemistry; Mathematics; English.

Ramos, Diego, 1905. *Mexico City, Mexico.*
Departments: *Civil Engineering;* Mathematics; Physics; Chemistry; Electrical Engineering; Economics.

Wakamiya, Yasuke, 1905. *Toyama, Japan.*
Departments: *Civil Engineering;* Chemistry; Electrical Engineering.

FOR BACHELOR OF ARTS

Crotty, Oswald Martin, 1908. *Cleveland, Ohio.*
Departments: American History; Law; Philosophy.

Gallagher, Donald Joseph, 1907. *El Paso, Texas.*
Departments: Chemistry; Sociology; Economics; American History; Physics.

Lora y Romero, Mariano, 1906. *Havana, Cuba.*
Departments: *Civil Engineering;* Mathematics; Chemistry; Physics; Philosophy; American History; English; Economics.

Mulvanity, Frank Alphonso, 1907. *Nashua, N. H.*
Departments: Sociology; American History; Philosophy; Physics; Modern Irish; Law; Biology; Economics.

Nicrosi, Peter Marie, 1905. *Montgomery, Ala.*
Departments: American History; Latin; Law; Philosophy; Sociology.

Ralph, Edward Joseph, 1905. *Washington, D. C.*
Departments: *Chemistry;* American History; Philosophy.

Toomey, Vincent LeRoy, 1908. *Washington, D. C.*
Departments: Physics; Mathematics; American History; English; Latin.

OTHER CANDIDATES AND STUDENTS

Allen, James Edward, 1907. *Norfolk, Va.*
Departments: *Electrical Engineering;* Civil Engineering; Physics; Chemistry; Mathematics.

Ballard, Robert Jeremiah, 1906. *Portsmouth, N. H.*
Departments: *Electrical Engineering;* Mathematics; Physics; Civil Engineering.

Bast, Rev. Victor August, S.S. 1908. *Washington, D. C.*
A. B. (St. Mary's Seminary, Baltimore, Md.) 1904; S. T. B. (*ibid.*) 1908.
Departments: Physics; Chemistry; Mathematics.

Blair, Walter Gibson, 1907. *Washington, D. C.*
Departments: *Civil Engineering;* Mathematics; Physics; Electrical Engineering; Applied Mechanics.

Bohn, August Joseph, 1908. *Washington, D. C.*
Departments: *Civil Engineering;* Physics; Chemistry; Mathematics; American History; German.

Boillin, James Joseph, 1908. *Clarksville, Tenn.*
Departments: *Civil Engineering;* Chemistry, Mathematics; English; American History; Physics.

Butt, Frank Henry, 1907. *Washington, D. C.*
Departments: *Electrical Engineering;* Mathematics; Chemistry; Civil Engineering.

Cantwell, John James, 1908. *Washington, D. C.*
Departments: *Civil Engineering;* Physics; Chemistry; Mathematics; Electrical Engineering; American History; German; Applied Mechanics.

Caples, Joseph Edward, 1908. *El Paso, Texas.*
Departments: Chemistry; Philosophy.

Carbo, Joseph Ignatius, 1907. *Washington, D. C.*
Department: *Chemistry.*

Carter, Thomas Hochman, 1907. *Washington, D. C.*
Departments: *Electrical Engineering;* Civil Engineering; Mathematics; Chemistry; Physics; American History; Applied Mechanics.

Crowe, Joseph Nicholas, 1907. *Washington, D. C.*
Departments: *Electrical Engineering;* Civil Engineering; Mathematics; Chemistry; Physics; American History; History.

Daly, John Joseph, 1907. *Phoebus, Va.*
Departments: *Electrical Engineering;* Civil Engineering; Mathematics; Philosophy; Physics; Chemistry.

Darr, Charles W., Jr., 1908. *Washington, D. C.*
Departments: *Chemistry;* American History; English; Sociology; Economics; Latin.

Davis, Ernest Aloysius, C.S.C., 1905. *Washington, D. C.*
A. B. (University of Notre Dame, Notre Dame, Ind.) 1904.
Department: *Chemistry.*

Deeds, John Francis, 1906. *Washington, D. C.*
Departments: *Civil Engineering;* Mathematics; Electrical Engineering.

deQuevedo, Xavier Garcia, 1908. *Guadalajara, Mexico.*
Departments: *Electrical Engineering;* Physics; Chemistry; Mathematics; English.

De Vries, Joseph Roland, 1907. *Arlington, Md.*
Departments: *Electrical Engineering;* Chemistry; Mathematics; Civil Engineering; English; History; Physics.

DeWulf, Emiel Peter Francis, C.S.C., 1904. *Washington, D. C.*
A. B. (University of Notre Dame, Notre Dame, Ind.) 1903.
Department: *Mechanics.*

Edwards, John, Jr., 1908. *Washington, D. C.*
Departments: *Electrical Engineering;* Civil Engineering; Mathematics; Physics.

Emerson, Joseph George, 1908. *Thousand Islands, N. Y.*
Departments: *Civil Engineering;* Physics; Chemistry; Mathematics; German.

Farley, Ignatius Joseph, 1907. *Washington, D. C.*
B. S. (St. John's College, Washington, D. C.) 1907.
Departments: *Civil Engineering;* Chemical Engineering; Mathematics; Chemistry; Mechanics; Electrical Engineering; German.

Finn, John Louis, 1908. *Washington, D. C.*
Departments: Chemistry; Mathematics; Civil Engineering.

Greer, John James, 1908. *Washington, D. C.*
Departments: Chemistry; Civil Engineering.

Gury, Karl Ernst, 1905. *Washington, D. C.*
Departments: *Electrical Engineering;* Mathematics; Civil Engineering; Applied Mechanics; German.

Haggenmiller, Rev. Benno, O.F.M., 1908. *Washington, D. C.*
Departments: Physics; Chemistry; Mathematics.

Harbin, George Francis, Jr., 1908. *Washington, D. C.*
A. B. (Georgetown University, Washington, D. C.) 1902; E. E. (The Catholic University of America) 1905; Diploma (From the Westinghouse Electric and Mfg. Company's School of Engineering) 1908.
Departments: *Electrical Engineering;* Physics.

Hatcher, William Edward, 1907. *Brookland, D. C.*
Departments: Chemistry; German.

Hessler, Bernard Philip, 1907. *Washington, D. C.*
B. S. (St. John's College, Washington, D. C.) 1907.
Departments: *Civil Engineering;* Physics; Chemistry; Mathematics; Electrical Engineering; German.

Holm, Alberto G., 1908. *Oxaca, Mexico.*
Department: *Chemistry.*

Kelly, John Walker, 1905. *Washington, D. C.*
Department: *Electrical Engineering;* Mathematics; Civil Engineering; Applied Mechanics; German.

Kelly, Louis McMahon, C.S.C., 1907. *Washington, D. C.*
Litt. B. (University of Notre Dame, Notre Dame, Ind.) 1907.
Department: *Mathematics.*

Kilcoyne, William, 1908. *Danbury, Conn.*
Departments: Physics; Philosophy; Law; Biology.

Kittleberger, George, Jr., 1908. *Detroit, Mich.*
Departments: *Electrical Engineering;* Chemistry; Mathematics.

Mahony, William Reginald, A.P., 1908. *Washington, D. C.*
Department: Mathematics.

Mecaslin, John Henry, 1908. *Atlanta, Ga.*
Departments: *Chemistry;* Civil Engineering.

Molony, William Hayes, C.S.C., 1907. *Washington, D. C.*
Litt. B. (University of Notre Dame, Notre Dame, Ind.) 1907.
Department: *Mathematics.*

Montrose, Marshall Henry, 1907. *Washington, D. C.*
Department: Chemistry.

McCarthy, Charles Stephen, 1907. *Brookland, D. C.*
Departments: *Civil Engineering;* Mathematics; Physics; American History.

McElroy, Walter Shanley, 1908. *Bridgeport, Conn.*
Departments: Physics; Philosophy; Law; Biology.

McGeady, Peter Leo, 1908. *Wanamie, Pa.*
Departments: *Civil Engineering;* Physics; Chemistry; Mathematics; German.

McKenna, Charles Francis, 1907. *New York, N. Y.*
Departments: *Civil Engineering;* Chemistry; Mathematics; American History; English; Physics; German.

McWilliams, Christian John, 1908. *New York, N. Y.*
HIBERNIAN SCHOLAR.
Departments: Celtic; Chemistry; Mathematics; Civil Engineering.

O'Donnell, Timothy Vincent, 1908. *Albion, N. Y.*
Departments: Chemistry; Mathematics; French; English; Latin; General History.

Perry, Louis Franklin, 1906. *Washington, D. C.*
Departments: Mathematics; Civil Engineering; Electrical Engineering; German.

Rivero, Horace Martin, 1908. *Washington, D. C.*
Departments: *Civil Engineering;* Physics; Chemistry; Mathematics; American History; German.

Simmons, Oliver George, 1908. *Washington, D. C.*
Departments: Chemistry; Mathematics.

Sweeney, Thomas Crew, 1908. *Helena, Montana.*
Departments: *Electrical Engineering;* Physics; Chemistry.

Theriault, Emery Joseph, 1908. *Van Buren, Maine.*
Departments: Physics; Chemistry; Mathematics; Civil Engineering; German.

Thomas, Howard Milford, 1906. *Washington, D. C.*
A. B. (Howard University, Washington, D. C.) 1906.
Departments: *Mathematics;* Civil Engineering; Applied Mechanics.

Thompson, Thomas Jefferson, 1905. *Webster, Mass.*
A. B. (Harvard University, Cambridge, Mass.) 1903; C. E. (The Catholic University of America) 1906.
Department: *Civil Engineering.*

Wagner, Rev. Ignatius Albert, 1908. *Carthagena, Ohio.*
A. B. (St. Joseph's College, Collegeville, Ind.) 1904.
Departments: Physics; Chemistry; Mathematics.

Walsh, Joseph Dixon, 1907. *Washington, D. C.*
Departments: Chemistry; American History; General History; French; Law.

Walsh, Norris Peters, 1908. *Washington, D. C.*
Departments; Chemistry; Mathematics; Civil Engineering.

Zmich, Rev. Stephen, 1909. *Washington, D. C.*
Departments: Physics; Chemistry.

SUMMARY

Candidates for degrees in June, 1909	12
Other candidates and students	55
Total	67

UNIVERSITY OF ILLINOIS-URBANA
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